```
DDDDDDDDDDDD     RRRRRRRRRRRR        IIIIIIIII     VVV         VVV  EEEEEEEEEEEEEEE  RRRRRRRRRRRR
DDDDDDDDDDDD     RRRRRRRRRRRR        IIIIIIIII     VVV         VVV  EEEEEEEEEEEEEEE  RRRRRRRRRRRR
DDDDDDDDDDDD     RRRRRRRRRRRR        IIIIIIIII     VVV         VVV  EEEEEEEEEEEEEEE  RRRRRRRRRRRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRR         RRR        III        VVV         VVV  EEE              RRR         RRR
DDD         DDD  RRRRRRRRRRRR           III        VVV         VVV  EEEEEEEEEEEE     RRRRRRRRRRRR
DDD         DDD  RRRRRRRRRRRR           III        VVV         VVV  EEEEEEEEEEEE     RRRRRRRRRRRR
DDD         DDD  RRRRRRRRRRRR           III        VVV         VVV  EEEEEEEEEEEE     RRRRRRRRRRRR
DDD         DDD  RRR   RRR              III        VVV         VVV  EEE              RRR   RRR
DDD         DDD  RRR   RRR              III        VVV         VVV  EEE              RRR   RRR
DDD         DDD  RRR   RRR              III        VVV         VVV  EEE              RRR   RRR
DDD         DDD  RRR      RRR           III           VVV   VVV     EEE              RRR      RRR
DDD         DDD  RRR      RRR           III           VVV   VVV     EEE              RRR      RRR
DDD         DDD  RRR      RRR           III           VVV   VVV     EEE              RRR      RRR
DDDDDDDDDDDD     RRR         RRR     IIIIIIIII           VVV        EEEEEEEEEEEEEEE  RRR         RRR
DDDDDDDDDDDD     RRR         RRR     IIIIIIIII           VVV        EEEEEEEEEEEEEEE  RRR         RRR
DDDDDDDDDDDD     RRR         RRR     IIIIIIIII           VVV        EEEEEEEEEEEEEEE  RRR         RRR
```

J 7

FILEID**LPDRIVER

```
LL          PPPPPPPP    DDDDDDDD    RRRRRRRR      IIIIII    VV      VV  EEEEEEEEEE  RRRRRRRR
LL          PPPPPPPP    DDDDDDDD    RRRRRRRR      IIIIII    VV      VV  EEEEEEEEEE  RRRRRRRR
LL          PP      PP  DD      DD  RR      RR      II      VV      VV  EE          RR      RR
LL          PP      PP  DD      DD  RR      RR      II      VV      VV  EE          RR      RR
LL          PP      PP  DD      DD  RR      RR      II      VV      VV  EE          RR      RR
LL          PP      PP  DD      DD  RR      RR      II      VV      VV  EE          RR      RR
LL          PPPPPPPP    DD      DD  RRRRRRRR        II      VV      VV  EEEEEEEE    RRRRRRRR
LL          PPPPPPPP    DD      DD  RRRRRRRR        II      VV      VV  EEEEEEEE    RRRRRRRR
LL          PP          DD      DD  RR  RR          II      VV      VV  EE          RR  RR
LL          PP          DD      DD  RR  RR          II      VV      VV  EE          RR  RR
LL          PP          DD      DD  RR    RR        II        VV  VV    EE          RR    RR         ....
LL          PP          DD      DD  RR    RR        II        VV  VV    EE          RR    RR         ....
LLLLLLLLLL  PP          DDDDDDDD    RR      RR    IIIIII        VV      EEEEEEEEEE  RR      RR       ....
LLLLLLLLLL  PP          DDDDDDDD    RR      RR    IIIIII        VV      EEEEEEEEEE  RR      RR       ....

LL            IIIIII      SSSSSSSS
LL            IIIIII      SSSSSSSS
LL              II      SS
LL              II      SS
LL              II      SS
LL              II      SS
LL              II        SSSSSS
LL              II        SSSSSS
LL              II              SS
LL              II              SS
LL              II              SS
LL              II              SS
LLLLLLLLLL    IIIIII    SSSSSSSS
LLLLLLLLLL    IIIIII    SSSSSSSS
```

Table of contents

```
0000          .TITLE  LPDRIVER - LP11/LS11/LV11 LINE PRINTER DRIVER
0000          .IDENT  'V04-000'
0000
0000  ;
0000  ;****************************************************************************
0000  ;*                                                                          *
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0000  ;*                                                                          *
0000  ;*                                                                          *
0000  ;****************************************************************************
0000
0000  ; ABSTRACT:
0000  ;
0000  ;       LP11/LS11/LV11 LINE PRINTER DRIVER
0000  ;
0000  ; AUTHOR:
0000  ;
0000  ;       R. HEINEN 6-SEP-76
0000  ;
0000  ; MODIFIED BY:
0000  ;
0000  ;       V03-011 EMD0085         Ellen M. Dusseault      30-Apr-1984
0000  ;               Add DEV$M_NNM characteristic to DEVCHAR2 so that these
0000  ;               devices will have the "node2" prefix.
0000  ;
0000  ;       V03-010 EMD0084         Ellen M. Dusseault      19-Apr-1984
0000  ;               Fix problem with lowercase p not appearing.  It was
0000  ;               accidently put in the control table so remove it.
0000  ;
0000  ;       V03-009 EAD0150         Elliott A. Drayton      13-Apr-1984
0000  ;               Change the sense of the TRUNCATE branch
0000  ;               and make truncate the default.
0000  ;
0000  ;       V03-008 EAD0147         Elliott A. Drayton      12-Apr-1984
0000  ;               Added support for TAB and TRUNCATE.
0000  ;
0000  ;       V03-007 EMD0077         Ellen M. Dusseault      10-Apr-1984
0000  ;               Modify to make code more efficient.
0000  ;
0000  ;       V03-006 EMD0047         Ellen M. Dusseault      22-Jan-1984
0000  ;               Add new feature, fallback.  The ability to convert 8-bit
```

```
0000    ;               ascii characters to their 7-bit equivalent representation
0000    ;
0000    ;       V03-005 TCM0001         Trudy C. Matthews       14-Dec-1983
0000    ;               Change NOP wait loops to use calibrated EXE$GL_UBDELAY cell.
0000    ;
0000    ;       V03-004 EAD0069         Elliott A. Drayton      6-Jan-1983
0000    ;               Changed default number of lines per page to 66.
0000    ;
0000    ;       V03-003 EAD0068         Elliott A. Drayton      21-Sep-1982
0000    ;               Correct UCB$L_LP_OFLCNT storage allocation from byte
0000    ;               to longword. Also reposition code for LP ready test.
0000    ;
0000    ;       V03-002 EAD0067         Elliott A. Drayton      01-Jul-1982
0000    ;               Change branch instructions for horizontal position tests.
0000    ;
0000    ;       V03-001 KDM0002         Kathleen D. Morse       28-Jun-1982
0000    ;               Added $DYNDEF, $DCDEF, and $PRDEF.
0000    ;
0000    ;--
```

```
                    0000         .SBTTL  Declarations
                    0000
                    0000   ;
                    0000   ; MACRO LIBRARY CALLS
                    0000   ;
                    0000
                    0000           $CRBDEF                         ;DEFINE CRB OFFSETS
                    0000           $DCDEF                          ;DEFINE DEVICE TYPES
                    0000           $DDBDEF                         ;DEFINE DDB OFFSETS
                    0000           $DPTDEF                         ;DEFINE DPT OFFSETS
                    0000           $DYNDEF                         ;DEFINE DYNAMIC DATA STRUCTURE TYPES
                    0000           $IDBDEF                         ;DEFINE IDB OFFSETS
                    0000           $IODEF                          ;DEFINE I/O FUNCTION CODES
                    0000           $IRPDEF                         ;DEFINE IRP OFFSETS
                    0000           $JIBDEF                         ;DEFINE JIB OFFSETS
                    0000           $LPDEF                          ;DEFINE LINE PRINTER CHARACTERISTICS
                    0000           $MSGDEF                         ;DEFINE SYSTEM MESSAGE TYPES
                    0000           $PCBDEF                         ;DEFINE PCB OFFSETS
                    0000           $PRDEF                          ;DEFINE PROCESSOR REGISTER NUMBERS
                    0000           $SSDEF                          ;DEFINE SYSTEM STATUS CODES
                    0000           $UCBDEF                         ;DEFINE UCB OFFSETS
                    0000           $VECDEF                         ;DEFINE VEC OFFSETS
                    0000
                    0000   ;
                    0000   ; LOCAL SYMBOLS
                    0000   ;
                    0000   ; ARGUMENT LIST OFFSET DEFINITIONS
                    0000   ;
                    0000
          00000000  0000   P1=0                                    ;First function dependent parameter
          00000004  0000   P2=4                                    ;Second function dependent parameter
          00000008  0000   P3=8                                    ;Third function dependent parameter
          0000000C  0000   P4=12                                   ;Fourth function dependend parameter
          00000010  0000   P5=16                                   ;Fifth function dependent parameter
          00000014  0000   P6=20                                   ;Sixth function dependent parameter
          00000780  0000   LP_HRCNT=1920                           ;Timeout value for one hour
                    0000
                    0000   ;
                    0000   ; CHARACTER CODE DEFINITIONS
                    0000   ;
                    0000
          0000000D  0000   C_CR=13                                 ;Carriage return
          0000000C  0000   C_FF=12                                 ;Form feed
          0000000B  0000   C_VT=11                                 ;Verticle tab
          0000000A  0000   C_LF=10                                 ;Line feed
          00000009  0000   C_TAB=9                                 ;Tabulation
                    0000
                    0000   ;
                    0000   ; FLAG REGISTER BIT DEFINITIONS
                    0000   ;
                    0000
          00000001  0000   M_CRPEND=1                              ;Carriage return pending
          00000000  0000   V_CRPEND=0                              ;
                    0000
                    0000   ;
                    0000   ; LP11/LS11/LV11 DEVICE REGISTER OFFSET DEFINITIONS
                    0000   ;
```

```
                 0000
                 0000              $DEFINI LP
                 0000
                 0000      $DEF    LP_CSR          .BLKW   1       ;CONTROL STATUS REGISTER
                 0002              $VIELD  LP_CSR,6,<-
                 0002                      <IE,,M>,-
                 0002                      <DONE,,M>,-
                 0002                      >
                 0002      $DEF    LP_DBR          .BLKW   1       ;DATA BUFFER REGISTER
                 0004
                 0004              $DEFEND LP
                 0000
                 0000      ;
                 0000      ; DEFINE DEVICE DEPENDENT UNIT CONTROL BLOCK OFFSETS
                 0000      ;
                 0000
                 0000              $DEFINI UCB
                 0000
        00000090 0000      .=UCB$K_LENGTH                          ;
                 0090
                 0090      $DEF    UCB$L_LP_MUTEX  .BLKL   1       ;Line printer UCB mutex
                 0094      $DEF    UCB$L_LP_TIMEOUT .BLKL  1       ;Printer problem message timer
                 0098      $DEF    UCB$L_LP_OFLCNT .BLKL   1       ;Offline time counter
                 009C      $DEF    UCB$B_LP_CURSOR .BLKB   1       ;Current horizontal position
                 009D      $DEF    UCB$B_LP_LINCNT .BLKB   1       ;Current line count on page
                 009E      $DEF    UCB$B_SPARE     .BLKB   2       ;SPARE UNUSED BYTES
                 00A0
        000000A0 00A0      UCB$K_SIZE=.
                 00A0              $DEFEND UCB
```

```
0000            .SBTTL  Driver prologue table and driver dispatch table
0000
0000    ;
0000    ; LOCAL DATA
0000    ;
0000    ; DRIVER PROLOGUE TABLE
0000    ;
0000
0000            DPTAB   -                               ;DEFINE DRIVER PROLOGUE TABLE
0000                    END=LP_END,-                    ;End of driver
0000                    ADAPTER=UBA,-                   ;Adapter type
0000                    UCBSIZE=UCB$K_SIZE,-            ;UCB size
0000                    NAME=LPDRIVER                   ;Driver name
0038            DPT_STORE INIT                          ;Control block init values
0038            DPT_STORE UCB,UCB$B_FIPL,B,8            ;Fork IPL
003C            DPT_STORE UCB,UCB$L_DEVCHAR,L,-         ;Device characteristics
003C                    <DEV$M_REC-                     ; Record oriented
003C                    !DEV$M_AVL-                     ; Available
003C                    !DEV$M_CCL-                     ; Carriage control device
003C                    !DEV$M_ODV>                     ; Output device
0043            DPT_STORE UCB,UCB$L_DEVCHAR2,L,-        ; Device characteristics
0043                    <DEV$M_NNM>                     ; prefix name with "node$"
004A            DPT_STORE UCB,UCB$B_DEVCLASS,B,DC$_LP ;Device class
004E            DPT_STORE UCB,UCB$B_DEVTYPE,B,LP$_LP11 ;Device type
0052            DPT_STORE UCB,UCB$W_DEVBUFSIZ,W,132 ;Default buffer size
0057            DPT_STORE UCB,UCB$L_DEVDEPEND,L,-
0057                    <66@24+LP$M_MECHFORM!LP$M_TRUNCATE> ;Printer parameters
005E            DPT_STORE UCB,UCB$B_DIPL,B,20   ;Device IPL
0062            DPT_STORE UCB,UCB$L_LP_MUTEX,W,-1 ;Initialize mutex
0067            DPT_STORE REINIT                        ;Control block re-init values
0067            DPT_STORE CRB,CRB$L_INTD+4,D,LP$INT ;Interrupt service routine address
006C            DPT_STORE CRB,CRB$L_INTD+VEC$L_INITIAL,D,LP_LX11_CINIT ;Controller init
0071            DPT_STORE CRB,CRB$L_INTD+VEC$L_UNITINIT,D,LP_LX11_INIT ;Unit init
0076            DPT_STORE DDB,DDB$L_DDT,D,LP$DDT ;DDT address
007B            DPT_STORE END                           ;
0000
0000    ;
0000    ; DRIVER DISPATCH TABLE
0000    ;
0000
0000            DDTAB   LP,-                            ;DRIVER DISPATCH TABLE
0000                    STARTIO,-                       ;Start I/O operation
0000                    0,-                             ;Unsolicited interrupt
0000                    FUNCTABLE,-                     ;Function table
0000                    +IOC$CANCELIO,-                 ;Cancel I/O
0000                    0,-                             ;Register dump routine
0000                    0,-                             ;Size of diagnostic buffer
0000                    0                               ;Size of error log buffer
```

```
0038          .SBTTL  LP11/LS11/LV11 Function decision table
0038  ;
0038  ; LP11/LS11/LV11 FUNCTION DECISION TABLE
0038  ;
0038
0038  FUNCTABLE:                                    ;FUNCTION DECISION TABLE
0038          FUNCTAB ,-                            ;Legal functions
0038                  <SENSECHAR,-                  ;Sense characteristics
0038                   SETCHAR,-                    ;Set characteristics
0038                   SENSEMODE,-                  ;Sense mode
0038                   SETMODE,-                    ;Set mode
0038                   WRITELBLK,-                  ;Write logical block
0038                   WRITEPBLK,-                  ;Write physical block
0038                   WRITEVBLK>                   ;Write virtual block
0040          FUNCTAB ,-                            ;LEGAL FUNCTIONS
0040                  <SENSECHAR,-                  ;Sense characteristics
0040                   SETCHAR,-                    ;Set characteristics
0040                   SENSEMODE,-                  ;Sense mode
0040                   SETMODE,-                    ;Set mode
0040                   WRITELBLK,-                  ;Write logical block
0040                   WRITEPBLK,-                  ;Write physical block
0040                   WRITEVBLK>                   ;Write virtual block
0048          FUNCTAB LP_WRITE,<WRITELBLK,WRITEPBLK,WRITEVBLK> ;Write functions
0054          FUNCTAB LP_SETMODE,<SETCHAR,SETMODE> ;Set characteristics functions
0060          FUNCTAB +EXE$SENSEMODE,-              ;
0060                  <SENSECHAR,-                  ;Sense characteristics
0060                   SENSEMODE>                   ;Sense mode
```

```
                        006C            .SBTTL  Set characteristics and set mode function processing
                        006C    ;+
                        006C    ; LP_SETMODE - SET CHARACTERISTICS AND SET MODE FUNCTION PROCESSING
                        006C    ;
                        006C    ; THIS ROUTINE IS CALLED FROM THE FUNCTION DECISION TABLE DISPATCHER TO PROCESS
                        006C    ; A SET MODE FUNCTION TO A LINE PRINTER.
                        006C    ;
                        006C    ; INPUTS:
                        006C    ;
                        006C    ;       R0 = SCRATCH.
                        006C    ;       R1 = SCRATCH.
                        006C    ;       R2 = SCRATCH.
                        006C    ;       R3 = ADDRESS OF I/O REQUEST PACKET.
                        006C    ;       R4 = CURRENT PROCESS PCB ADDRESS.
                        006C    ;       R5 = ASSIGNED DEVICE UCB ADDRESS.
                        006C    ;       R6 = ADDRESS OF CCB.
                        006C    ;       R7 = I/O FUNCTION CODE.
                        006C    ;       R8 = FUNCTION DECISION TABLE DISPATCH ADDRESS.
                        006C    ;       R9 = SCRATCH.
                        006C    ;       R10 = SCRATCH.
                        006C    ;       R11 = SCRATCH.
                        006C    ;       AP = ADDRESS OF FIRST FUNCTION DEPENDENT PARAMETER.
                        006C    ;
                        006C    ; OUTPUTS:
                        006C    ;
                        006C    ;       THE SPECIFIED CHARACTERISTICS ARE MOVED INTO THE DEVICE UCB AND THE
                        006C    ;       I/O IS COMPLETED.
                        006C    ;-
                        006C
                        006C   LP_SETMODE:                                     ;Set mode function processing
           51    6C   D0  006C          MOVL    P1(AP),R1                       ;Get address of characteristics
                          006F          IFNORD  #8,(R1),20$                     ;Can characteristics quadword be read?
                 53   DD  0075          PUSHL   R3                              ;Save packet address
      50   0090  C5   9E  0077          MOVAB   UCB$L_LP_MUTEX(R5),R0           ;Get address of UCB mutex
        00000000'GF   16  007C          JSB     G^SCH$LOCKW                     ;Lock UCB for write access
           57    23   D1  0082          CMPL    #IO$_SETMODE,R7                 ;Set mode function?
                 04   13  0085          BEQL    10$                             ;If EQL yes
        40 A5    61   B0  0087          MOVW    (R1),UCB$B_DEVCLASS(R5)         ;Set device class and type
     42 A5    02 A1   B0  008B   10$:   MOVW    2(R1),UCB$W_DEVBUFSIZ(R5)       ;Set default buffer size
     44 A5    04 A1   D0  0090          MOVL    4(R1),UCB$L_DEVDEPEND(R5)       ;Set device characteristics
        00000000'GF   16  0095          JSB     G^SCH$UNLOCK                    ;Unlock UCB
              53 8ED0     009B          POPL    R3                              ;Restore packet
           50    01   3C  009E          MOVZWL  #SS$_NORMAL,R0                  ;Set normal completion status
        00000000'GF   17  00A1          JMP     G^EXE$FINISHIOC                 ;
           50    0C   3C  00A7   20$:   MOVZWL  #SS$_ACCVIO,R0                  ;Set access violation status
        00000000'GF   17  00AA          JMP     G^EXE$ABORTIO                   ;
```

```
                       00B0          .SBTTL  Write function processing
                       00B0   ;+
                       00B0   ; LP_WRITE - WRITE FUNCTION PROCESSING
                       00B0   ;
                       00B0   ; THIS ROUTINE IS CALLED FROM THE FUNCTION DECISION TABLE DISPATCHER TO PROCESS
                       00B0   ; A WRITE PHYSICAL, WRITE LOGICAL, OR WRITE VIRTUAL FUNCTION TO A LINE PRINTER.
                       00B0   ;
                       00B0   ; INPUTS:
                       00B0   ;
                       00B0   ;        R0 = SCRATCH.
                       00B0   ;        R1 = SCRATCH.
                       00B0   ;        R2 = SCRATCH.
                       00B0   ;        R3 = ADDRESS OF I/O REQUEST PACKET.
                       00B0   ;        R4 = CURRENT PROCESS PCB ADDRESS.
                       00B0   ;        R5 = ASSIGNED DEVICE UCB ADDRESS.
                       00B0   ;        R6 = ADDRESS OF CCB.
                       00B0   ;        R7 = I/O FUNCTION CODE.
                       00B0   ;        R8 = FUNCTION DECISION TABLE DISPATCH ADDRESS.
                       00B0   ;        R9 = SCRATCH.
                       00B0   ;        R10 = SCRATCH.
                       00B0   ;        R11 = SCRATCH.
                       00B0   ;        AP = ADDRESS OF FIRST FUNCTION DEPENDENT PARAMETER.
                       00B0   ;
                       00B0   ; OUTPUTS:
                       00B0   ;
                       00B0   ;        THE FUNCTION PARAMETERS ARE CHECKED AND THE USER'S BUFFER IS FORMATTED
                       00B0   ;        AND COPIED INTO A SYSTEM BUFFER FOR PROCESSING BY THE LINE PRINTER
                       00B0   ;        DRIVER.
                       00B0   ;-
                       00B0
                       00B0   LP_WRITE:                                         ;WRITE FUNCTION PROCESSING
             5B   D4   00B0           CLRL    R11                               ;Clear total number of overhead bytes
             5A   D4   00B2           CLRL    R10                               ;Assume write pass all function
        5E   5D   D0   00B4   FORMAT: MOVL    FP,SP                             ;Remove all temporaries from stack
      10F8   8F   BB   00B7           PUSHR   #^M<R3,R4,R5,R6,R7,AP>            ;Save registers
        58   6C   D0   00BB           MOVL    P1(AP),R8                         ;Get starting address of user buffer
     59   04 AC   3C   00BE           MOVZWL  P2(AP),R9                         ;Get length of user buffer
  03 44 A5   08   E1   00C2           BBC     #LP$V_PASSALL,UCB$L_DEVDEPEND(R5),5$ ; If CLR, not passall
        57   0B   D0   00C7           MOVL    #IO$_WRITEPBLK,R7                 ;Force write physical
        57   0B   D1   00CA   5$:     CMPL    #IO$_WRITEPBLK,R7                 ;Write physical block?
             1B   13   00CD           BEQL    10$                               ;If EQL yes
  3C A3   0C AC   D0   00CF           MOVL    P4(AP),IRP$B_CARCON(R3)           ;Insert carriage control information
   00000000'GF    16   00D4           JSB     G^EXE$CARRIAGE                    ;Translate carriage control information
     50   3C A3   9A   00DA           MOVZBL  IRP$B_CARCON(R3),R0               ;Get number of prefix control bytes
     51   3E A3   9A   00DE           MOVZBL  IRP$B_CARCON+2(R3),R1             ;Get number of suffix control bytes
        51   50   C0   00E2           ADDL    R0,R1                             ;Calculate number of carriage control bytes
   5A   20 A14B   9E   00E5           MOVAB   32(R1)[R11],R10                   ;Calculate total number of overhead bytes
             59   D5   00EA   10$:    TSTL    R9                                ;Any buffer specified?
             09   13   00EC           BEQL    20$                               ;If EQL no
        50   58   7D   00EE           MOVQ    R8,R0                             ;Retrieve buffer parameters
   00000000'GF    16   00F1           JSB     G^EXE$WRITECHK                    ;Check accessibility of user buffer
   51   0C A94A   9E   00F7   20$:    MOVAB   12(R9)[R10],R1                    ;Calculate length of buffer required
   00000000'GF    16   00FC           JSB     G^EXE$BUFFRQUOTA                  ;Check if process has sufficient quota
          03 50   E8   0102           BLBS    R0,25$                            ;If LBS quota ok
           0081   31   0105           BRW     45$                               ;If LBC quota check failure
   00000000'GF    16   0108   25$:    JSB     G^EXE$ALLOCBUF                    ;Allocate buffer for line printer output
          78 50   E9   010E           BLBC    R0,45$                            ;If LBC allocation failure
```

```
           53    6E  D0  0111          MOVL    (SP),R3                 ;Retrieve address of I/O packet
        2C A3    52  D0  0114          MOVL    R2,IRP$L_SVAPTE(R3)     ;Save address of buffered I/O packet
     50  0080    C4  D0  0118          MOVL    PCB$L_JIB(R4),R0        ;Get JIB address
        20 A0    51  C2  011D          SUBL    R1,JIB$L_BYTCNT(R0)     ;Adjust buffered I/O quota
        30 A3    51  B0  0121          MOVW    R1,IRP$W_BOFF(R3)       ;Set number of bytes charged to quota
           38    A3  D4  0125          CLRL    IRP$L_MEDIA(R3)         ;Clear line feed count in packet
        32 A3    59  B0  0128          MOVW    R9,IRP$W_BCNT(R3)       ;Insert size of user buffer
        52    0C A2  9E  012C          MOVAB   12(R2),R2               ;Get address of buffer data area
     50  0090    C5  9E  0130          MOVAB   UCB$L_LP_MUTEX(R5),R0   ;Get address of UCB mutex
     00000000'   GF  16  0135          JSB     G^SCH$LOCKW             ;Lock UCB for write access
           57    0B  D1  013B          CMPL    #IO$_WRITEPBLK,R7       ;Write pass all?
           53    13  013E              BEQL    50$                     ;If EQL yes
        51       0C  A2  0140          SUBW    #12,R1                  ;Calculate actual length of data area
     54  009C    C5  9A  0143          MOVZBL  UCB$B_LP_CURSOR(R5),R4  ;Get current horizontal carriage position
        56    68 A5  3C  0148          MOVZWL  UCB$W_DEVSTS(R5),R6     ;Get current carriage return pending flag
     57  009D    C5  9A  014C          MOVZBL  UCB$B_LP_LINCNT(R5),R7  ;Get current line on page
        5A    42 A5  3C  0151          MOVZWL  UCB$W_DEVBUFSIZ(R5),R10 ;Get width of printer carriage
           5C    20  D0  0155          MOVL    #^X20,AP                ;Assume printer does not have lower case
  02 44 A5       07  E1  0158          BBC     #LP$V_LOWER,UCB$L_DEVDEPEND(R5),35$ ;If CLR, no lower case
                 5C  D4  015D          CLRL    AP                      ;Set for printer with lower case
                 54  10  015F  35$:    BSBB    70$                     ;Insert prefix carriage control
                 59  D7  0161  30$:    DECL    R9                      ;Any more bytes to transfer to system buffer
                 07  19  0163          BLSS    40$                     ;If LSS no
        50       88  9A  0165          MOVZBL  (R8)+,R0                ;Get next byte from user buffer
                 73  10  0168          BSBB    WRITE_BYTE              ;Write byte in system buffer
                 F5  11  016A          BRB     30$                     ;
                 53  10  016C  40$:    BSBB    80$                     ;Insert suffix carriage control in buffer
        52    2C A3  C2  016E          SUBL    IRP$L_SVAPTE(R3),R2     ;Calculate length of output plus header
  3A A3    52    0C  A3  0172          SUBW3   #12,R2,IRP$L_MEDIA+2(R3) ;Calculate actual length of output buffer
     009C C5     54  90  0177          MOVB    R4,UCB$B_LP_CURSOR(R5)  ;Save current horizontal carriage position
68 A5  01    00  56  F0  017C          INSV    R6,#V_CRPEND,#1,UCB$W_DEVSTS(R5) ;Save carriage return pending
     009D C5     57  90  0182          MOVB    R7,UCB$B_LP_LINCNT(R5)  ;Save current line on page
                 12  11  0187          BRB     60$                     ;
        10F8     8F  BA  0189  45$:    POPR    #^M<R3,R4,R5,R6,R7,AP>  ;Restore registers
     00000000'   GF  17  018D          JMP     G^EXE$ABORTIO           ;
        3A A3    59  B0  0193  50$:    MOVW    R9,IRP$L_MEDIA+2(R3)    ;Insert number of bytes to print
     62    68    59  28  0197          MOVC    R9,(R8),(R2)            ;Move characters to system buffer
        10F8     8F  BA  019B  60$:    POPR    #^M<R3,R4,R5,R6,R7,AP>  ;Restore registers
                 53  DD  019F          PUSHL   R3                      ;Save address of I/O packet
     50  0090    C5  9E  01A1          MOVAB   UCB$L_LP_MUTEX(R5),R0   ;Get address of UCB mutex
     00000000'   GF  16  01A6          JSB     G^SCH$UNLOCK            ;Unlock UCB
              53 8ED0    01AC          POPL    R3                      ;Restore address of I/O packet
     00000000'   GF  17  01AF          JMP     G^EXE$QIODRVPKT         ;Queue I/O packet to driver
                         01B5
                         01B5  ;
                         01B5  ; SUBROUTINE TO INSERT CARRIAGE CONTROL IN BUFFER
                         01B5  ;
                         01B5
        7E    3C A3  9A  01B5  70$:    MOVZBL  IRP$B_CARCON(R3),-(SP)  ;Get number of characters to output
                 1F  13  01B9          BEQL    100$                    ;If EQL none
        50    3D A3  9A  01BB          MOVZBL  IRP$B_CARCON+1(R3),R0   ;Get character to output
                 0A  11  01BF          BRB     85$                     ;
        7E    3E A3  9A  01C1  80$:    MOVZBL  IRP$B_CARCON+2(R3),-(SP) ;Get number of characters to output
                 13  13  01C5          BEQL    100$                    ;If EQL none
        50    3F A3  9A  01C7          MOVZBL  IRP$B_CARCON+3(R3),R0   ;Get character to output
                 08  12  01CB  85$:    BNEQ    90$                     ;If NEQ character specified
        50       0D  9A  01CD          MOVZBL  #C_CR,R0                ;Get carriage return
```

```
         0B   10  01D0              BSBB    WRITE_BYTE                  ;Write byte in system buffer
    50   0A   9A  01D2              MOVZBL  #C_LF,R0                    ;Get line feed
         06   10  01D5        90$:  BSBB    WRITE_BYTE                  ;Write byte in system buffer
      FB 6E   F5  01D7              SOBGTR  (SP),90$                    ;Any more left to insert?
         8E   D5  01DA       100$:  TSTL    (SP)+                       ;Remove count from stack
              05  01DC              RSB                                 ;
```

```
                             01DD          .SBTTL  Write byte into system buffer
                             01DD   ;
                             01DD   ; SUBROUTINE TO FORMAT AND FILL SYSTEM BUFFER WITH LINE PRINTER OUTPUT ONE BYTE
                             01DD   ; AT A TIME.
                             01DD   ;
                             01DD
                             01DD   WRITE_BYTE:                                          ;WRITE BYTE INTO BUFFER
49 00000441'EF    50    E0   01DD           BBS     R0,CONTROL_TAB,40$                   ;If Set, Control character
           6E 56  00    E4   01E5           BBSC    #V_CRPEND,R6,60$                     ;If SET, carriage return pending
03 00000461'EF    50    E1   01E9   5$:     BBC     R0,LOWERCASE_TAB,10$                 ;If CLR, not lower case
              50  5C    C2   01F1           SUBL    AP,R0                                ;Convert character to upper case
                             01F4   10$:
              5A  54    D1   01F4           CMPL    R4,R10                               ;Still room on current line?
              1A  1F         01F7           BLSSU   15$                                  ;If LSS, yes
        15 44 A5  06    E1   01F9           BBC     #LP$V_TRUNCATE,UCB$L_DEVDEPEND(R5),15$ ;If CLEAR, notruncate
        1E 44 A5  04    E1   01FE           BBC     #LP$V_WRAP,UCB$L_DEVDEPEND(R5),30$ ; If CLR, then nowrap
                             0203
                  50    DD   0203   11$:    PUSHL   R0                                   ;Save the current character
              50  0D    9A   0205           MOVZBL  #C_CR,R0                             ;Get carriage return code
                  D3    10   0208           BSBB    WRITE_BYTE                           ;Insert code in system buffer
              50  0A    9A   020A           MOVZBL  #C_LF,R0                             ;Set line feed character
                0098    30   020D           BSBW    110$                                 ;Insert line feed into system buffer
                  50  8ED0   0210           POPL    R0                                   ;Restore current character
                             0213
                  54    D6   0213   15$:    INCL    R4                                   ;Increment horizontal position
                  51    D7   0215   20$:    DECL    R1                                   ;Any room left in system buffer?
                  12    19   0217           BLSS    37$                                  ;If less than, no
        04 44 A5  09    E0   0219   25$:    BBS     #LP$V_FALLBACK, UCB$L_DEVDEPEND(R5), 35$       ;if set, fallback
              82  50    90   021E           MOVB    R0,(R2)+                             ;Insert character in system buffer
                  05         0221   30$:    RSB                                          ;
                             0222
82   00000481'FF40      90   0222   35$:    MOVB    @TRANS_TAB[R0],(R2)+                 ;move translated character into system buffe
                        05   022A           RSB                                          ;return to caller, for another byte
                             022B
                0092    31   022B   37$:    BRW     150$                                 ;no room in system buffer
                             022E
                             022E   ;
                             022E   ; CONTROL CHARACTER ENCOUNTERED
                             022E   ;
                             022E
           7F 8F  50    91   022E   40$:    CMPB    R0,#^X7F                             ;Delete Character?
                  05    12   0232           BNEQ    45$                                  ;neg, not a delete character
        BB 44 A5  02    E0   0234           BBS     #LP$V_PRINTALL,UCB$L_DEVDEPEND(R5),10$ ; If SET, allow delete charac
                  E6    1E   0239   45$:    BGEQU   30$                                  ;If GEQU, non-printable character(multi)
              50  0D    D1   023B           CMPL    #C_CR,R0                             ;Carriage return?
                  0B    1F   023E           BLSSU   50$                                  ;If LSS no
                  22    1A   0240           BGTRU   70$                                  ;If GTRU no
        74 44 A5  00    E0   0242           BBS     #LP$V_CR,UCB$L_DEVDEPEND(R5),140$ ;If SET, carriage return required
              56  01    C8   0247           BISL    #M_CRPEND,R6                         ;Set carriage return pending
                  05         024A           RSB                                          ;
           08 56  00    E4   024B   50$:    BBSC    #V_CRPEND,R6,60$                     ;If SET, carriage return pending
        C1 44 A5  02    E0   024F           BBS     #LP$V_PRINTALL,UCB$L_DEVDEPEND(R5),20$ ;If SET, print character
                FFCA    31   0254           BRW     30$                                  ;Exit this is nonprintable
                  50    DD   0257   60$:    PUSHL   R0                                   ;Save current character
              50  0D    9A   0259           MOVZBL  #C_CR,R0                             ;Get carriage return character
                  5D    10   025C           BSBB    140$                                 ;Insert carriage return in buffer
                  50  8ED0   025E           POPL    R0                                   ;Retrieve current character
```

```
          FF79   31  0261             BRW     WRITE_BYTE                      ;
                     0264
                     0264      ;
                     0264      ; CHARACTER IS A TAB, LINE FEED, VERTICLE TAB, OR FORM FEED
                     0264      ;
                     0264
        50   09  D1  0264      70$:   CMPL    #C_TAB,R0                       ;Tabulation character?
             E2  1A  0267             BGTRU   50$                             ;If GTRU no
             17  1F  0269             BLSSU   80$                             ;If LSSU no
                     026B
                     026B      ;
                     026B      ; CHARACTER IS A TAB
                     026B      ;
                     026B
     E8 56   00  E4  026B             BBSC    #V_CRPEND,R6,60$                ;If SET, carriage return pending
  A1 44 A5   05  E0  026F             BBS     #LP$V_TAB,UCB$L_DEVDEPEND(R5),20$ ;If SET, do not expand TAB
        08   A4  9F  0274             PUSHAB  8(R4)                           ;Calculate next tab position
        6E   07  CA  0277             BICL    #7,(SP)                         ;Clear excess bits
        6E   54  C2  027A             SUBL    R4,(SP)                         ;Calculate blank count
        50   20  9A  027D             MOVZBL  #^A/ /,R0                       ;Set space character
             20  11  0280             BRB     100$                            ;
                     0282
                     0282      ;
                     0282      ; CHARACTER IS A LINE FEED, VERTICAL TAB, OR FORM FEED
                     0282      ;
                     0282
        50   0B  D1  0282      80$:   CMPL    #C_VT,R0                        ;Vertical tab?
             C4  13  0285             BEQL    50$                             ;If EQL yes
             22  1A  0287             BGTRU   110$                            ;If GTRU line feed
                     0289
                     0289      ;
                     0289      ; CHARACTER IS A FORM FEED
                     0289      ;
                     0289
     50   47 A5  9A  0289             MOVZBL  UCB$L_DEVDEPEND+3(R5),R0 ;Get number of lines per page
     7E   50 57  C3  028D             SUBL3   R7,R0,-(SP)                     ;Calculate number of lines to end of page
  09 44 A5   01  E1  0291             BBC     #LP$V_MECHFORM,UCB$L_DEVDEPEND(R5),90$ ;If CLR, no mechanical feed
     38 A3   8E  C0  0296             ADDL    (SP)+,IRP$L_MEDIA(R3)           ;Update number of lines printed
        50   0C  9A  029A             MOVZBL  #C_FF,R0                        ;Set form feed character
             17  11  029D             BRB     120$                            ;
        50   0A  9A  029F      90$:   MOVZBL  #C_LF,R0                        ;Set line feed character
          FF38   30  02A2      100$:  BSBW    WRITE_BYTE                      ;Insert byte in system buffer
        FA   6E  F5  02A5             SOBGTR  (SP),100$                       ;Any more bytes to insert?
             8E  D5  02A8             TSTL    (SP)+                           ;Remove loop count from stack
                 05  02AA             RSB                                     ;
                     02AB
                     02AB      ;
                     02AB      ; CHARACTER IS A LINE FEED
                     02AB      ;
                     02AB
                     02AB      110$:
             57  D6  02AB             INCL    R7                              ;Increment line position on page
        38   A3  D6  02AD             INCL    IRP$L_MEDIA(R3)                 ;Increment number of lines printed
     47 A5   57  91  02B0             CMPB    R7,UCB$L_DEVDEPEND+3(R5)        ;End of page?
             02  12  02B4             BNEQ    130$                            ;If NEQ no
             57  D4  02B6      120$:  CLRL    R7                              ;Clear line position on page
        56   01  CA  02B8      130$:  BICL    #M_CRPEND,R6                    ;Clear carriage return pending
```

```
              54   D4  02BB   140$:   CLRL    R4                          ;Clear horizontal position
            FF55   31  02BD           BRW     20$                         ;
                       02C0
                       02C0   ;
                       02C0   ; OUTPUT WILL NOT FIT IN ALLOCATED BUFFER
                       02C0   ;
                       02C0
      50   2C A3   D0  02C0   150$:   MOVL    IRP$L_SVAPTE(R3),R0         ;Get address of buffer to deallocate
           2C A3   D4  02C4           CLRL    IRP$L_SVAPTE(R3)            ;Indicate no buffer allocated
      5A   08 A0   3C  02C7           MOVZWL  IRP$W_SIZE(R0),R10          ;Save size of buffer
       00000000'GF 16  02CB           JSB     G^EXE$DEANONPAGED           ;Deallocate buffer
      5E   E8 AD   9E  02D1           MOVAB   -4*6(FP),SP                 ;Remove all temporaries from stack
         10F8 8F   BA  02D5           POPR    #^M<R3,R4,R5,R6,R7,AP>      ;Restore registers
     50   0080 C4  D0  02D9           MOVL    PCB$L_JIB(R4),R0            ;Get JIB address
       20 A0   5A  C0  02DE           ADDL    R10,JIB$L_BYTCNT(R0)        ;Adjust byte count quota
           5B   20 C0  02E2           ADDL    #32,R11                     ;Adjust count of overhead bytes
                53 DD  02E5           PUSHL   R3                          ;Save address of I/O packet
     50   0090 C5  9E  02E7           MOVAB   UCB$L_LP_MUTEX(R5),R0       ;Get address of UCB mutex
       00000000'GF 16  02EC           JSB     G^SCH$UNLOCK                ;Unlock UCB
             53 8ED0   02F2           POPL    R3                          ;Restore address of I/O packet
            FDBC   31  02F5           BRW     FORMAT                      ;Try again
                       02F8
```

```
                                02F8          .SBTTL  Line printer driver
                                02F8  ;+
                                02F8  ; STARTIO - START I/O OPERATION ON LINE PRINTERS
                                02F8  ;
                                02F8  ; THIS ROUTINE IS ENTERED WHEN THE ASSOCIATED UNIT IS IDLE AND A PACKET
                                02F8  ; IS AVAILABLE.
                                02F8  ;
                                02F8  ; INPUTS:
                                02F8  ;
                                02F8  ;       R3 = ADDRESS OF I/O REQUEST PACKET.
                                02F8  ;       R5 = UCB ADDRESS FOR IDLE UNIT.
                                02F8  ;
                                02F8  ; OUTPUTS:
                                02F8  ;
                                02F8  ;       NO EXPLICIT OUTPUTS - THE UNIT IS IN WAITING FOR INTERRPUT STATE
                                02F8  ;                             OR THE I/O IS COMPLETE.
                                02F8  ;-
                                02F8
                                02F8  STARTIO:
              53    58 A5   D0  02F8          MOVL    UCB$L_IRP(R5),R3          ;Retrieve address of I/O packet
                    3A A3   B0  02FC          MOVW    IRP$L_MEDIA+2(R3),-
                    7C A5       02FF                  UCB$W_BOFF(R5)            ;Set number of characters to print
              53    78 A5   D0  0301          MOVL    UCB$L_SVAPTE(R5),R3       ;Get address of system buffer
              53    0C A3   9E  0305          MOVAB   12(R3),R3                 ;Get address of data area
              54    24 A5   D0  0309          MOVL    UCB$L_CRB(R5),R4          ;Get address of CRB
              54    2C B4   D0  030D          MOVL    @CRB$L_INTD+VEC$L_IDB(R4),R4 ;Get device CSR address
                                0311  ;
                                0311  ; START NEXT OUTPUT SEQUENCE
                                0311  ;
                                0311
         50    54      02   C1  0311  10$:    ADDL3   #LP_DBR,R4,R0             ;Calculate address of data buffer register
            51    7C A5     3C  0315          MOVZWL  UCB$W_BOFF(R5),R1         ;Get number of characters remaining
         52    8080 8F      B0  0319          MOVW    #^X8080,R2                ;Get control register test mask
                   16       11  031E          BRB     25$                       ;Start output
              64   52       B3  0320  20$:    BITW    R2,(R4)                   ;Printer ready or have paper problem?
                   17       15  0323          BLEQ    30$                       ;If LEQ not ready or paper problem
              60   83       90  0325          MOVB    (R3)+,(R0)                ;Output next character
   7E   00000000'GF    01   78  0328          ASHL    #1, G^EXE$GL_UBDELAY,-(SP)        ;Delay 3*2 u-seconds
                FD 6E       F4  0330  24$:    SOBGEQ  (SP),24$                  ;Delay loop calibrated to machine speed
              5E   04       C0  0333          ADDL    #4,SP                     ;Pop extra longword off stack
                E7 51       F4  0336  25$:    SOBGEQ  R1,20$                    ;Any more characters to output?
                 009D       31  0339          BRW     70$                       ;All done, BRW to set return status
                                033C
                                033C  ;
                                033C  ; PRINTER IS NOT READY OR HAS PAPER PROBLEM
                                033C  ;
                                033C
                   30       12  033C  30$:    BNEQ    40$                       ;If NEQ paper problem
        7C A5    51    01   A1  033E          ADDW3   #1,R1,UCB$W_BOFF(R5)      ;Save number of characters remaining
                                0343          DSBINT  UCB$B_DIPL(R5)            ;Disable interrupts
         64    0080 8F      B3  034A          BITW    #^X80,LP_CSR(R4)          ;Is it ready now?
                   16       12  034F          BNEQ    35$                       ;If NEQ, yes its ready
         64      40 8F      88  0351          BISB    #^X40,LP_CSR(R4)          ;Set interrupt enable
                                0355          WFIKPCH 50$,#12                   ;Wait for ready interrupt
                                035F          IOFORK                            ;Create a fork process
                   AA       11  0365          BRB     10$                       ;  ...and start next output
                                0367
```

```
                                                        M  8
LPDRIVER                        - LP11/LS11/LV11 LINE PRINTER DRIVER    15-SEP-1984 23:59:04  VAX/VMS Macro V04-00       Page  15
V04-000                         Line printer driver                      5-SEP-1984 00:14:57  [DRIVER.SRC]LPDRIVER.MAR;1     (1)

                                 0367   35$:
                                 0367           ENBINT                                  ;Enable system interrupts
                       64    B4  036A           CLRW    LP_CSR(R4)                      ;Disable device interrupts
                       A3    11  036C           BRB     10$                             ;Go transfer more characters
                                 036E   ;
                                 036E   ; PRINTER HAS PAPER PROBLEM
                                 036E   ;
                                 036E
                 0098 C5     D4  036E   40$:    CLRL    UCB$L_LP_OFLCNT(R5)             ;Clear offline counter
           7C A5    51   01  A1  0372           ADDW3   #1,R1,UCB$W_BOFF(R5)            ;Save number of characters remaining
                       64    B4  0377   50$:    CLRW    LP_CSR(R4)                      ;Disable printer interrupt
                                 0379           SETIPL  UCB$B_FIPL(R5)                  ;Lower to fork level
                       64    B5  037D           TSTW    LP_CSR(R4)                      ;Printer still have paper problem?
                       08    19  037F           BLSS    55$                             ;If LSS yes
             0094 C5   0F    D0  0381           MOVL    #15,UCB$L_LP_TIMEOUT(R5);Set timeout value
                     FF88    31  0386           BRW     10$                             ; ...and start next output
           53 64 A5    03    E0  0389   55$:    BBS     #UCB$V_CANCEL,UCB$W_STS(R5),80$ ;If SET, cancel I/O operation
                                 038E
           01    0094 C5     F1  038E           ACBL    UCB$L_LP_TIMEOUT(R5),#1,-
           0028 0098 C5          0393                   UCB$L_LP_OFLCNT(R5),60$ ;Skip until timeout
                                 0398
                 0098 C5     D4  0398           CLRL    UCB$L_LP_OFLCNT(R5)             ;Reset counter
             00000780 8F     D1  039C           CMPL    #LP_HRCNT,-                     ;One hour timeout?
                  0094 C5        03A2                   UCB$L_LP_TIMEOUT(R5)
                       05    1B  03A5           BLEQU   57$                             ;If LSS yes and dont increment
             0094 C5   02    C4  03A7           MULL    #2,UCB$L_LP_TIMEOUT(R5)         ;Double message timeout value
                       18    BB  03AC   57$:    PUSHR   #^M<R3,R4>                      ;Save registers
                 54    05    9A  03AE           MOVZBL  #MSG$_DEVOFFLIN,R4              ;Set up message type
        53    00000000'GF    9E  03B1           MOVAB   G^SYS$GL_OPRMBX,R3              ;Address target mailbox
              00000000'GF    16  03B8           JSB     G^EXE$SNDEVMSG                  ;Send message ignore error
                       18    BA  03BE           POPR    #^M<R3,R4>                      ;Restore registers
                                 03C0   60$:    DSBINT  UCB$B_DIPL(R5)                  ;Disable interrupts
                                 03C7           WFIKPCH 50$,#2                          ;Wait for a timeout
                                 03D1           IOFORK                                  ;Create for process
                       9E    11  03D7           BRB     50$                             ;
                                 03D9
                                 03D9   ;
                                 03D9   ; I/O OPERATION SUCCESSFULLY COMPLETED
                                 03D9   ;
                                 03D9
                 50    01    3C  03D9   70$:    MOVZWL  #SS$_NORMAL,R0                  ;Set normal completion status
                    7C A5    B4  03DC           CLRW    UCB$W_BOFF(R5)                  ;Correct remaining character count
                       03    11  03DF           BRB     90$                             ;
                                 03E1
                                 03E1   ;
                                 03E1   ; I/O OPERATION CANCELED
                                 03E1   ;
                                 03E1
                 50    2C    3C  03E1   80$:    MOVZWL  #SS$_ABORT,R0                   ;Set operation aborted status
              53    58 A5    D0  03E4   90$:    MOVL    UCB$L_IRP(R5),R3                ;Retrieve address of I/O packet
              51    38 A3    3C  03E8           MOVZWL  IRP$L_MEDIA(R3),R1              ;Get number of lines printed
           7E A5    7C A5    A2  03EC           SUBW    UCB$W_BOFF(R5),UCB$W_BCNT(R5) ;Calculate number of characters
  50    10    10    7E A5    F0  03F1           INSV    UCB$W_BCNT(R5),#16,#16,R0 ;Insert number of characters in status
                                 03F7           REQCOM                                  ;Complete I/O request
                    03FD          .SBTTL  LP11/LS11/LV11 Line printer interrupt dispatcher
                    03FD  ;+
                    03FD  ; LP$INT - LP11/LS11/LV11 LINE PRINTER INTERRUPT DISPATCHER.
                    03FD  ;
                    03FD  ; THIS ROUTINE IS ENTERED VIA A JSB INSTRUCTION WHEN AN INTERRUPT OCCURS ON AN
                    03FD  ; LP11/LS11/LV11 LINE PRINTER CONTROLLER. THE STATE OF THE STACK ON ENTRY IS:
                    03FD  ;
                    03FD  ;       00(SP) = ADDRESS OF IDB ADDRESS.
                    03FD  ;       04(SP) = SAVED R3.
                    03FD  ;       08(SP) = SAVED R4.
                    03FD  ;       12(SP) = SAVED R5.
                    03FD  ;       16(SP) = INTERRUPT PC.
                    03FD  ;       20(SP) = INTERRUPT PSL.
                    03FD  ;
                    03FD  ; INTERRUPT DISPATCHING OCCURS AS FOLLOWS:
                    03FD  ;
                    03FD  ;       IF THE INTERRUPT IS EXPECTED, THEN THE DRIVER IS CALLED AT ITS INTERRUPT
                    03FD  ;       WAIT ADDRESS. ELSE THE INTERRUPT IS DISMISSED.
                    03FD  ;-
                    03FD
                    03FD  LP$INT::                                           ;Entry from dispatch
      53   9E   D0  03FD          MOVL    @(SP)+,R3                          ;Get address of IDB
      54   63   7D  0400          MOVQ    IDB$L_CSR(R3),R4                   ;Get controller CSR and owner UCB address
09 64 A5   01   E5  0403          BBCC    #UCB$V_INT,UCB$W_STS(R5),10$ ;If CLR, interrupt not expected
           64   B4  0408          CLRW    (R4)                               ;Disable output interrupts
   53   10 A5   D0  040A          MOVL    UCB$L_FR3(R5),R3                   ;Restore remainder of driver context
        0C B5   16  040E          JSB     @UCB$L_FPC(R5)                     ;Call driver at interrupt wait address
      50   8E   7D  0411  10$:    MOVQ    (SP)+,R0                           ;Restore registers
      52   8E   7D  0414          MOVQ    (SP)+,R2                           ;
      54   8E   7D  0417          MOVQ    (SP)+,R4                           ;
                02  041A          REI                                        ;
```

```
                              041B          .SBTTL  Line printer unit initialization
                              041B   ;+
                              041B   ; LP_LX11_INIT - LINE PRINTER UNIT INITIALIZATION
                              041B   ;
                              041B   ; THIS ROUTINE IS CALLED AT SYSTEM STARTUP AND AFTER A POWER FAILURE. THE
                              041B   ; ONLINE BIT IS SET FOR THE SPECIFIED UNIT.
                              041B   ;
                              041B   ; INPUTS:
                              041B   ;
                              041B   ;       R5 = ADDRESS OF DEVICE UCB.
                              041B   ;
                              041B   ; OUTPUTS:
                              041B   ;
                              041B   ;       THE ONLINE BIT IS SET IN THE DEVICE UCB AND THE ADDRESS OF THE UCB
                              041B   ;       IS FILLED INTO THE IDB OWNER FIELD.
                              041B   ;-
                              041B
                              041B   LP_LX11_INIT:                                  ;LINE PRINTER UNIT INITIALIZATION
            64 A5    10   A8  041B          BISW    #UCB$M_ONLINE,UCB$W_STS(R5) ;Set unit online
            50    24 A5   D0  041F          MOVL    UCB$L_CRB(R5),R0           ;Get address of CRB
            50    2C A0   D0  0423          MOVL    CRB$L_INTD+VEC$L_IDB(R0),R0 ;Get address of IDB
            04 A0    55   D0  0427          MOVL    R5,IDB$L_OWNER(R0)         ;Set address of device UCB
                          05  042B          RSB                                ;Return
                              042C
                              042C   LP_LX11_CINIT:                                 ;CONTROLLER INITIALIZATION
            50    18 A5   D0  042C          MOVL    IDB$L_UCBLST(R5),R0        ;Get address of UCB
          0094 C0    0F   D0  0430          MOVL    #15,UCB$L_LP_TIMEOUT(R0);Set timeout value
00000481'EF  00000485'EF  9E  0435          MOVAB   FALLTAB,TRANS_TAB          ;Get address of fallback table
                          05  0440          RSB                                ;
                              0441
```

```
               0441   722           .SBTTL  Tables for lowercase and control characters
               0441   723 ;
               0441   724 ;         Bit table to distinguish control characters
               0441   725 ;
               0441   726 CONTROL_TAB:
         FFFF  0441   727       .WORD ^B1111111111111111
         FFFF  0443   728       .WORD ^B1111111111111111
     00000000  0445   729       .LONG 0
     00000000  0449   730       .LONG 0
         0000  044D   731       .WORD 0
         8000  044F   732       .WORD ^B1000000000000000
         FFFF  0451   733       .WORD ^B1111111111111111
         FFFF  0453   734       .WORD ^B1111111111111111
     00000000  0455   735       .LONG 0
     00000000  0459   736       .LONG 0
     00000000  045D   737       .LONG 0
               0461   738
               0461   739 ;
               0461   740 ;         Bit table to distinguish lower case characters
               0461   741 ;
               0461   742 LOWERCASE_TAB:
     00000000  0461   743       .LONG 0
     00000000  0465   744       .LONG 0
     00000000  0469   745       .LONG 0
         FFFE  046D   746       .WORD ^B1111111111111110
         07FF  046F   747       .WORD ^B0000011111111111
     00000000  0471   748       .LONG 0
     00000000  0475   749       .LONG 0
     00000000  0479   750       .LONG 0
         FFFF  047D   751       .WORD ^B1111111111111111
         3FFE  047F   752       .WORD ^B0011111111111110
               0481   753
               0481   754 ;
               0481   755 ;         Pointer to the fallback tables
               0481   756 ;
               0481   757 TRANS_TAB:
    00000485'  0481   758       .LONG         FALLTAB
               0485   759
               0485   760
```

```
0485            .SBTTL  FALLBACK - table that will create fallback presentation
0485    ;++
0485    ;FALLBACK - TABLE TO ALLOW THE TERMINAL TO DO FALLBACK PRESENTATION OF
0485    ;               8BIT CHARACTERS on 7 bit terminals
0485    ;
0485    ; Description:
0485    ;       The following macros generate 1 table.  The table is a 256 byte
0485    ; table with the single character fallback representation of all the
0485    ; characters that can be represented by a single character, those with
0485    ; no fallback presentation at all are represented by the _ character,
0485    ;
0485    ;--
0485            .macro  $fallini
0485    $$=0
0485    .repeat 256
0485    .IF LE $$-<^X9F>            ; EVERYTHING BUT THE MULTINATIONAL SET SHOULD
0485                                ; ECHO AS ITSELF.
0485            .byte $$
0485    .IFF
0485            .BYTE ^A/_/
0485    .ENDC
0485    $$=$$+1
0485    .endr
0485    $$$=.
0485            .endm   $fallini
```

```
0485  ;++
0485  ; $FALL - generates the table entry for a given character
0485  ;
0485  ; Inputs:
0485  ;
0485  ;         CHARH - COLUMN IN THE ASCII TABLE.
0485  ;         CHARL - ROW IN THE ASCII TABLE.
0485  ;         FALLBACK - String that is the fallback representation
0485  ;         COUNT - Number of times to repeat this character
0485  ;--
0485              .MACRO  $FALL   CHARH,CHARL,FALLBACK,COUNT=1
0485  .=FALLTAB+<CHARH*16>+CHARL
0485  .REPEAT COUNT
0485  .NCHR   SLEN,^\FALLBACK\
0485  .IF EQ  SLEN-1
0485          .BYTE   ^A/FALLBACK/
0485  .ENDR
0485          .ENDM   $FALL
```

```
0485    ;++
0485    ; $FALLEND - GENERATES END CONDITIONS FOR THE FALLBACK TABLE
0485    ;
0485    ; Description:
0485    ;
0485    ;       Resets the . to the end of the fallback table
0485    ;
0485    ; Inputs:
0485    ;
0485    ;       None
0485    ;--
0485            .MACRO  $FALLEND
0485    .=$$$
0485            .ENDM   $FALLEND
```

```
0485
0485    FALLTAB::
0485            $FALLINI
0585            $FALL   10,1,!
0527            $FALL   10,2,c
0528            $FALL   10,3,L
0529            $FALL   10,5,Y
052B            $FALL   10,8,O
052E            $FALL   10,10,a
0530            $FALL   11,0,o
0536            $FALL   11,1,+
0537            $FALL   11,2,2
0538            $FALL   11,3,3
0539            $FALL   11,5,u
053B            $FALL   11,7,.
053D            $FALL   11,9,1
053F            $FALL   11,10,o
0540            $FALL   11,15,?
0545            $FALL   12,0,A,6
054B            $FALL   12,7,C
054D            $FALL   12,8,E,4
0551            $FALL   12,12,I,4
0555            $FALL   13,1,N
0557            $FALL   13,2,O,5
055C            $FALL   13,8,O
055E            $FALL   13,9,U,4
0562            $FALL   13,13,Y
0563            $FALL   14,0,a,6
056B            $FALL   14,7,c
056D            $FALL   14,8,e,4
0571            $FALL   14,12,i,4
0575            $FALL   15,1,n
0577            $FALL   15,2,o,5
057C            $FALL   15,8,o
057E            $FALL   15,9,u,4
0582            $FALL   15,13,y
0583            $FALLEND
0585
0585
0585    LP_END:                                         ;Address of last location in driver
0585
0585            .END
```

```
$$                        = 00000100                        IOC$RETURN                    ********    X    03
$$$                       = 00000585 R       03             IOC$WFIKPCH                   ********    X    03
$$OP                      = 00000002                        IRP$B_CARCON                = 0000003C
AT$_UBA                   = 00000001                        IRP$L_MEDIA                 = 00000038
CONTROL_TAB                 00000441 R       03             IRP$L_SVAPTE                = 0000002C
CRB$L_INTD                = 00000024                        IRP$W_BCNT                  = 00000032
C_CR                      = 0000000D                        IRP$W_BOFF                  = 00000030
C_FF                      = 0000000C                        IRP$W_SIZE                  = 00000008
C_LF                      = 0000000A                        JIB$L_BYTCNT                = 00000020
C_TAB                     = 00000009                        LOWERCASE_TAB                 00000461 R       03
C_VT                      = 0000000B                        LP$DDT                        00000000 RG      03
DC$_LP                    = 00000043                        LP$INT                        000003FD RG      03
DDB$L_DDT                 = 0000000C                        LP$M_MECHFORM               = 00000002
DEV$M_AVL                   ********    X    02             LP$M_TRUNCATE               = 00000040
DEV$M_CCL                   ********    X    02             LP$V_CR                     = 00000000
DEV$M_NNM                   ********    X    02             LP$V_FALLBACK               = 00000009
DEV$M_ODV                   ********    X    02             LP$V_LOWER                  = 00000007
DEV$M_REC                   ********    X    02             LP$V_MECHFORM               = 00000001
DPT$C_LENGTH              = 00000038                        LP$V_PASSALL                = 00000008
DPT$C_VERSION             = 00000004                        LP$V_PRINTALL               = 00000002
DPT$INITAB                  00000038 R       02             LP$V_TAB                    = 00000005
DPT$REINITAB                00000067 R       02             LP$V_TRUNCATE               = 00000006
DPT$TAB                     00000000 R       02             LP$V_WRAP                   = 00000004
DYN$C_CRB                 = 00000005                        LP$_LP11                    = 00000001
DYN$C_DDB                 = 00000006                        LP_CSR                        00000000
DYN$C_DPT                 = 0000001E                        LP_DBR                        00000002
DYN$C_UCB                 = 00000010                        LP_END                        00000585 R       03
EXE$ABORTIO                 ********    X    03             LP_HRCNT                    = 00000780
EXE$ALLOCBUF                ********    X    03             LP_LX11_CINIT                 0000042C R       03
EXE$BUFFRQUOTA              ********    X    03             LP_LX11_INIT                  0000041B R       03
EXE$CARRIAGE                ********    X    03             LP_SETMODE                    0000006C R       03
EXE$DEANONPAGED             ********    X    03             LP_WRITE                      000000B0 R       03
EXE$FINISHIOC               ********    X    03             MASKH                       = 00000080
EXE$GL_UBDELAY              ********    X    03             MASKL                       = 08000000
EXE$IOFORK                  ********    X    03             MSG$_DEVOFFLIN              = 00000005
EXE$QIODRVPKT               ********    X    03             M_CRPEND                    = 00000001
EXE$SENSEMODE               ********    X    03             P1                          = 00000000
EXE$SNDEVMSG                ********    X    03             P2                          = 00000004
EXE$WRITECHK                ********    X    03             P3                          = 00000008
FALLTAB                     00000485 RG      03             P4                          = 0000000C
FORMAT                      000000B4 R       03             P5                          = 00000010
FUNCTABLE                   00000038 R       03             P6                          = 00000014
FUNCTAB_LEN               = 00000034                        PCB$L_JIB                   = 00000080
IDB$L_CSR                 = 00000000                        PR$_IPL                     = 00000012
IDB$L_OWNER               = 00000004                        SCH$LOCKW                     ********    X    03
IDB$L_UCBLST              = 00000018                        SCH$UNLOCK                    ********    X    03
IO$_SENSECHAR             = 0000001B                        SIZ...                      = 00000001
IO$_SENSEMODE             = 00000027                        SLEN                        = 00000001
IO$_SETCHAR               = 0000001A                        SS$_ABORT                   = 0000002C
IO$_SETMODE               = 00000023                        SS$_ACCVIO                  = 0000000C
IO$_VIRTUAL               = 0000003F                        SS$_NORMAL                  = 00000001
IO$_WRITELBLK             = 00000020                        STARTIO                       000002F8 R       03
IO$_WRITEPBLK             = 0000000B                        SYS$GL_OPRMBX                 ********    X    03
IO$_WRITEVBLK             = 00000030                        TRANS_TAB                     00000481 R       03
IOC$CANCELIO                ********    X    03             UCB$B_DEVCLASS              = 00000040
IOC$MNTVER                  ********    X    03             UCB$B_DEVTYPE               = 00000041
IOC$REQCOM                  ********    X    03             UCB$B_DIPL                  = 0000005E
```

```
UCB$B_FIPL                       = 0000000B
UCB$B_LP_CURSOR                    0000009C
UCB$B_LP_LINCNT                    0000009D
UCB$B_SPARE                        0000009E
UCB$K_LENGTH                     = 00000090
UCB$K_SIZE                       = 000000A0
UCB$L_CRB                        = 00000024
UCB$L_DEVCHAR                    = 00000038
UCB$L_DEVCHAR2                   = 0000003C
UCB$L_DEVDEPEND                  = 00000044
UCB$L_FPC                        = 0000000C
UCB$L_FR3                        = 00000010
UCB$L_IRP                        = 00000058
UCB$L_LP_MUTEX                     00000090
UCB$L_LP_OFLCNT                    00000098
UCB$L_LP_TIMEOUT                   00000094
UCB$L_SVAPTE                     = 00000078
UCB$M_ONLINE                     = 00000010
UCB$V_CANCEL                     = 00000003
UCB$V_INT                        = 00000001
UCB$W_BCNT                       = 0000007E
UCB$W_BOFF                       = 0000007C
UCB$W_DEVBUFSIZ                  = 00000042
UCB$W_DEVSTS                     = 00000068
UCB$W_STS                        = 00000064
VEC$L_IDB                        = 00000008
VEC$L_INITIAL                    = 0000000C
VEC$L_UNITINIT                   = 00000018
V_CRPEND                         = 00000000
WRITE_BYTE                         000001DD R      03

                                             +-----------------+
                                             ! Psect synopsis !
                                             +-----------------+

PSECT name                       Allocation          PSECT No.  Attributes
----------                       ----------          ---------  ----------
.  ABS  .                        00000000  (     0.)  00 (  0.)  NOPIC   USR   CON   ABS   LCL NOSHR NOEXE NORD  NOWRT NOVEC BYTE
$ABS$                            000000A0  (   160.)  01 (  1.)  NOPIC   USR   CON   ABS   LCL NOSHR   EXE   RD    WRT NOVEC BYTE
$$$105_PROLOGUE                  0000007C  (   124.)  02 (  2.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD    WRT NOVEC BYTE
$$$115_DRIVER                    00000585  (  1413.)  03 (  3.)  NOPIC   USR   CON   REL   LCL NOSHR   EXE   RD    WRT NOVEC LONG

                                          +--------------------------+
                                          ! Performance indicators !
                                          +--------------------------+

Phase                        Page faults    CPU Time       Elapsed Time
-----                        -----------    --------       ------------
Initialization                        29    00:00:00.04    00:00:00.80
Command processing                   105    00:00:00.38    00:00:04.34
Pass 1                               565    00:00:17.62    00:01:02.00
Symbol table sort                      0    00:00:02.34    00:00:09.09
Pass 2                               167    00:00:03.52    00:00:11.18
Symbol table output                   18    00:00:00.11    00:00:00.70
Psect synopsis output                  2    00:00:00.01    00:00:00.01
Cross-reference output                 0    00:00:00.00    00:00:00.00
Assembler run totals                 888    00:00:24.03    00:01:28.13
```

```
The working set limit was 1950 pages.
149698 bytes (293 pages) of virtual memory were used to buffer the intermediate code.
There were 120 pages of symbol table space allocated to hold 2159 non-local and 54 local symbols.
863 source lines were read in Pass 1, producing 19 object records in Pass 2.
41 pages of virtual memory were used to define 38 macros.

                                              +----------------------------+
                                              ! Macro library statistics !
                                              +----------------------------+

Macro library name                            Macros defined
------------------                            --------------
_$255$DUA28:[SYS.OBJ]LIB.MLB;1                         22
_$255$DUA28:[SYSLIB]STARLET.MLB;2                      11
TOTALS (all libraries)                                 33

2424 GETS were required to define 33 macros.

There were no errors, warnings or information messages.

MACRO/LIS=LIS$:LPDRIVER/OBJ=OBJ$:LPDRIVER MSRC$:LPDRIVER/UPDATE=(ENH$:LPDRIVER)+EXECML$/LIB
```

0112 AH-BT13A-SE
VAX/VMS V4.0

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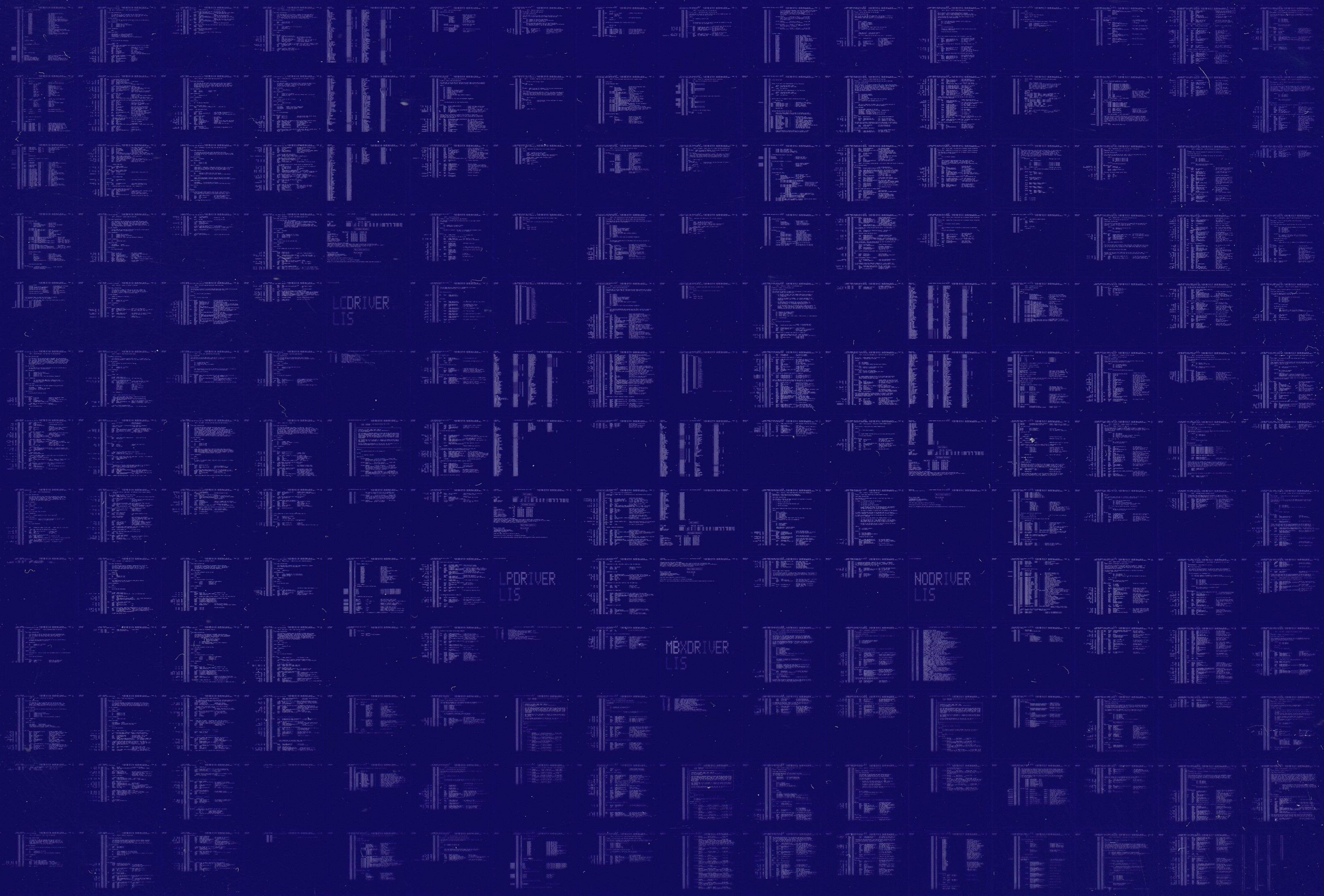
LCDRIVER
LIS

LPDRIVER
LIS

NODRIVER
LIS

MBXDRIVER
LIS